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RECIPROCATING SWIVELING SWITCHOVER TYPE SHAKING MACHINE

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RECIPROCATING SWIVELING SWITCHOVER TYPE SHAKING MACHINE

[Ofuku senkai kirikaekei no shintoki]

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Claim

A reciprocating swiveling switchover type shaking machine characterized by the fact that a shake table capable of reciprocating motion in a direction that crosses the direction of movement of a supporting truck is mounted on a supporting truck that undergoes reciprocating straight motion on a machine frame and a bearing part for a driven shaft capable of switching between a reciprocating straight motion and an eccentric swivel motion is provided at the center of the aforementioned shake table.

Detailed explanation of the invention

Industrial application field

This invention relates to a shaking machine provided with functions of both a reciprocating straight motion and an eccentric swivel motion.

Problems to be solved by this invention

In a conventional shaking machine used in shaking a culture and the like, two systems, namely, a system that shakes by undergoing a reciprocating straight motion and a system that shakes by undergoing an eccentric swivel motion are provided separately and there are occasions when a difference was created in data showing the development and results of a culture sample due to the difference in the shaking system. Therefore, because there are cases that require data obtained by shaking using the two systems depending on the sample, installing two machines separately creates a problem of difficulty in implementation from the standpoint of cost and installation space.

The purpose of the present invention is to solve the aforementioned problem by providing a shaking machine capable of switching between a reciprocating straight motion and an eccentric swivel motion with a simple operation, and moreover, the structure is simple and can be provided at a relatively low cost.

Constitution of the invention

The present invention is a reciprocating swiveling switchover type shaking machine characterized by the fact that a shake table capable of reciprocating motion in a direction that crosses the direction of movement of a supporting truck is mounted on a supporting truck that undergoes a reciprocating straight motion on a machine frame and a bearing part for a driven shaft capable of switching between a reciprocating straight motion and an eccentric swivel motion is provided at the center of the aforementioned shake table.

Embodiment of the invention

Below, an application example will be described based on the figures

Motor (2) attached with a decelerator is provided at one corner of box shape machine frame (1) and rotating shaft (7), which is supported by upper and lower bearings (5) and (6) and has pulley (4) for receiving the power of motor (2) via V belt (3), is provided at the center part of machine frame (1). Rotating shaft (7) supports horizontal rotating disc (8) by projecting its upper end through the ceiling plate (1a) of machine frame (1). Eccentric shaft (11) provided with bearing (10) at the upper part is inserted in fixing member (9) having slot (9a) attached on the upper face of

rotating disc (8). Eccentric shaft (11) is capable of adjusting the amount of eccentricity by moving within slot (9a). (12) is a fixing nut.

Shake table (13) with a square shape plan view and arranged on machine frame (1) is provided with oblong shape bearing hole (14) at the center part thereof, vertical wall (15) is formed on four sides by being folded down, and said shake table is mounted on guide rollers (17) attached so as to expose their upper half at the four outer end parts of opposing side walls (16a) and (16a) of supporting truck (16), which is arranged under shake table (13) and is smaller. Guide rollers (17) are arranged to be positioned at both sides on the longitudinal sides of aforementioned bearing hole (14).

Supporting truck (16) has bearing hole (18) of identical shape and identical direction as bearing hole (14) of shake table (13) at the center, running wheels (19) are provided at four inside end parts located under side walls (16b) and (16b) on the non-attachment side of aforementioned guide rollers (17), and said wheels are mounted on rails (20) and (20) attached to ceiling plate (1a) of machine frame (1) such that bearing (10) of eccentric shaft (11) is mated to bearing hole (18) and bearing hole (14)

(21) is a thin switchover plate attached to one longitudinal side of bearing hole (14) of shake table (13) to freely move forward and backward and there is bearing fixation part (23) of approximately identical width as bearing (10) at the center position where sliding slant faces (22) and (22) intersect while sliding slant faces (22) and (22) are opened on the bearing hole (14) side. Both sides of switchover plate (21) contact guide rails (24) and (24), connecting lever (25) attached at the rear end is connected to one side of operating lever (27) fixed to shake table (13) at supporting point (26), and switchover plate (21) fixes bearing (10) at the center part of bearing hole (14) by moving forward to the bearing hole (14) side according to elongation of rod (28a) of electro-magnetic cylinder (28) connected to the other side of operating lever (27) or releases bearing (10) according to a reverse operation.

Shake table (13) is normally positioned at the center part of supporting truck (16) and is composed not to vibrate on rollers (17) according to the tension of spring members (29) and (29), wherein each has one end fixed to a guide roller (17) and (17) on one side of supporting truck (16). (30) is a attachable/detachable frame provided for mounting containers such as a flask and the like.

Operation of the invention

Next, operating examples of reciprocating straight motion and eccentric swivel motion according to switchover operation of the present invention will be described.

(1) When using the shaking machine of the present invention for a reciprocating straight shaking, rod (28a) of electro-magnetic cylinder (28) is contracted according to the operation of a switch (not shown in the figure) as shown in Figure 4 and fixation of bearing (10) is released by the

backward movement of switchover plate (21). Rotating shaft (7) is rotated by driving motor (2) and swivels eccentric shaft (11) fixed on rotating disc (8) with the eccentric width thereof as the radius. Then, bearing (10) can move freely within both bearing holes (14) and (18) of supporting truck (16) and shake table (13) and hence the force functioning in the longitudinal direction of bearing holes (14) and (18) on the swiveling track of eccentric shaft (10) does not function on either supporting truck (16) or shake table (13) as shown in the explanatory diagram in Figure 5, and only the force functioning in a direction other than the aforementioned direction functions. However, the movement of supporting truck (16) is restricted by rails (20) hence the force functioning in directions other than the longitudinal direction of bearing holes (14) and (18) is completely converted into a force that operates supporting truck (16) in a straight motion, and shake table (13) repeats a reciprocating straight motion with the rotating diameter of eccentric shaft (11) as the amplitude along with supporting truck (16). Shake table (13) does not vibrate due to the tension of spring members (29) and (29) and is supported as one body at the center position on supporting truck (16).

(2) When using the shaking machine of the present invention for an eccentric swivel shaking, rod (28a) of electro-magnetic cylinder (28) is elongated with the operation of a switch (not shown in the figure) as shown in Figure 6 and fixes bearing (10) at the center part of bearing hole (14) by moving switchover plate (21) forward to the bearing hole (14) side. Switchover plate (21) is provided with sliding slant faces (22) and (22) opened at the front part; hence even if bearing (10) is displaced from the center position, it is guided smoothly to bearing fixation part (23) according to the forward movement of switchover plate (21).

Then, when motor (2) is driven, shake table (13) fixed with bearing (10) at the center part performs a swiveling motion of the same track as eccentric shaft (11) according to switchover plate (21). As shown in Figure 7, this operation is realized by the combination of a vertical and a horizontal reciprocating straight motion wherein supporting truck (16) undergoes a reciprocating straight motion as described above and shake table (13) supported on supporting truck (16) according to guide rollers (17) moves in a direction that crosses the moving direction of supporting truck (16).

Spring members (29) and (29) that function to integrate shake table (13) and supporting truck (16) during a reciprocating straight shaking are prevented from hindering the movement of shake table (13) on supporting truck (16) by setting the tension thereof to be weaker than the turning force of eccentric shaft (11).

Also, in both the aforementioned reciprocating straight shaking and eccentric swivel shaking, an adjustment in amplitude can be achieved just by moving eccentric shaft (11), which is inserted in fixing member (9) on rotating disc (8), within slot (9a).

The means for fixing the eccentric shaft at the center of the shake table is not restricted to the switchover plate of the application example and can be replaced with other structures such as sandwiching from both sides with two bars, etc.

Effect of the invention

The aforementioned shaking machine of the present invention can be easily used for both reciprocating straight shaking and eccentric swivel shaking according to a simple operation of switching over the bearing part of the shake table between the shake table and the supporting truck bearing an eccentric shaft in bearing holes of laterally oblong shape and there is an effect of being able to obtain accurate data showing the development and results produced in samples, etc., in both shaking operation modes. Also, the shake table and the supporting truck, which operate separately during an eccentric swivel shaking, are operated with a single eccentric shaft which is the single power source. Therefore, in both shaking operations the magnitude of the amplitude can be adjusted by simply moving the eccentric shaft even though the machine is a switchover type shaking machine. As a consequence, there is the effect of being able to minimize failures by simplifying the structure as well as being able to provide a shaking machine that can be handled conveniently at a relatively low cost since it is possible to maintain a low manufacturing cost.

Brief description of the figures

Figure 1 is a vertically sectioned frontal view of an application example of the present invention, Figure 2 is a frontal view showing a state of having detached the frame, Figure 3 is a plan view of the same, Figure 4 is a partial plan view showing the position of the switchover plate during reciprocating straight shaking, Figure 5 is an explanatory diagram showing the operating relationship between the eccentric shaft and the bearing hole in same, Figure 6 is a partial plan view showing the position of the switchover plate during eccentric swivel shaking, and Figure 7 is an explanatory diagram showing the operating relationship when the shake table shakes with an eccentric swivel motion according to a combination of the reciprocating straight motion of the shake table that crosses the reciprocating straight motion of the supporting truck.

(1)...machine frame, (2)...motor, (3)...V-belt, (4)...pulley, (5), (6)...upper and lower bearings, (7)...rotating shaft, (8)...rotating disc, (9)...fixing member, (10)...bearing, (11)...eccentric shaft, (12)...nut, (13)...shake table, (14)...bearing hole, (15)...vertical wall, (16)...supporting truck, (17)...guide roller, (18)...bearing hole, (19)...wheel, (20), (20)...rails, (21)...switchover plate, (22), (22)...sliding slant faces, (23)...bearing fixation part, (24), (24)...guide rails, (25)...connecting lever, (26)...supporting point, (27)...operating lever, (28)...electro-magnetic cylinder, (29), (29)...spring members, (30)...frame

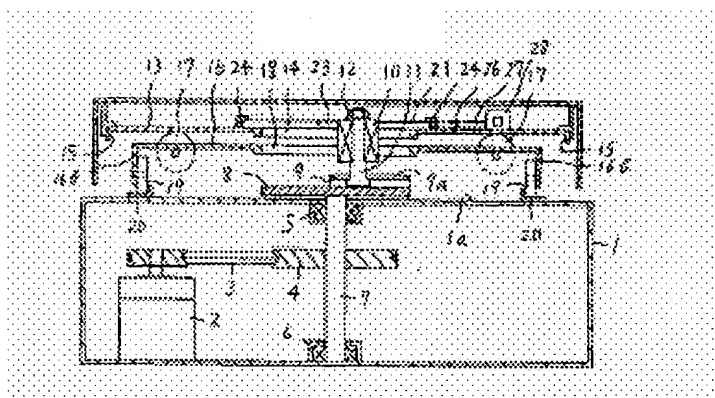


Figure 1

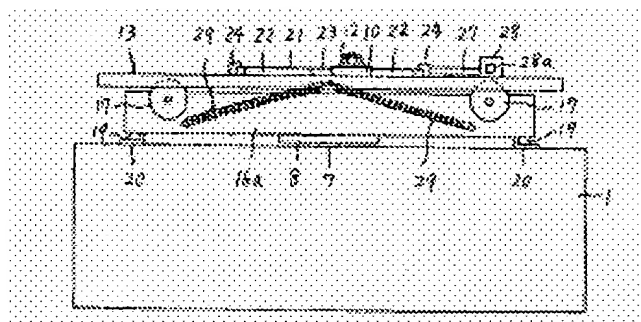


Figure 2

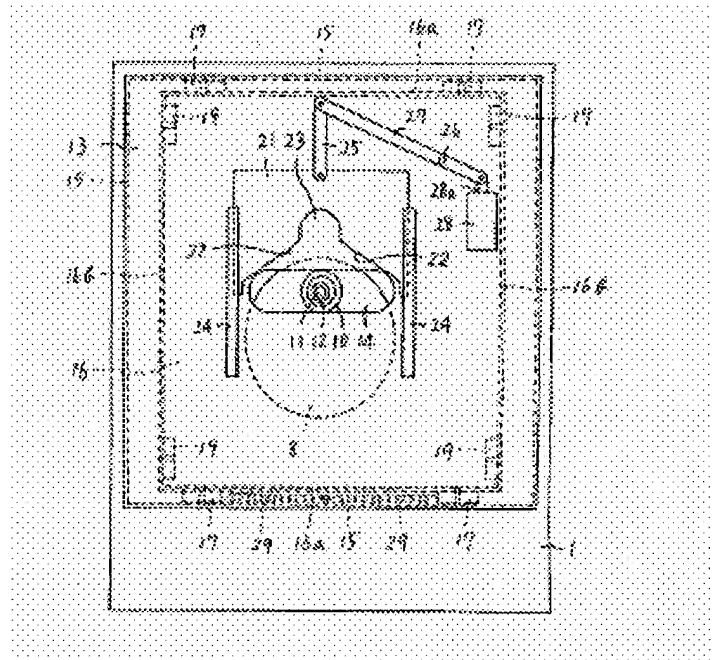


Figure 3

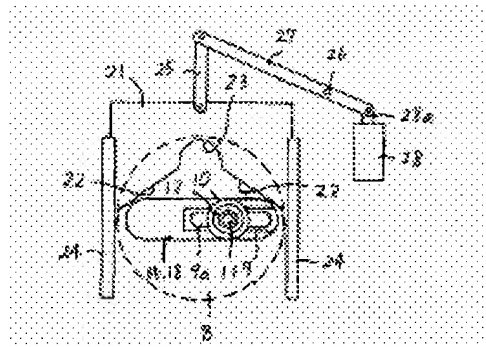


Figure 4

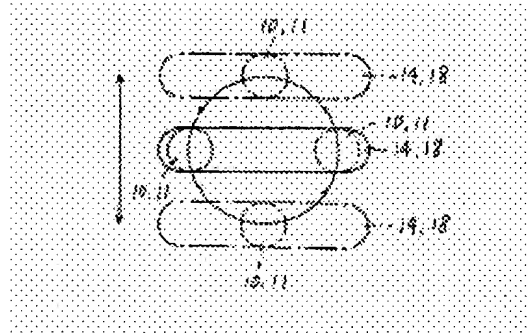


Figure 5

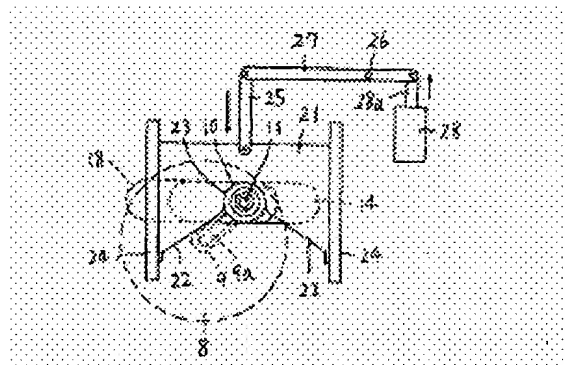


Figure 6

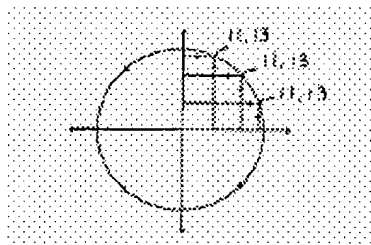


Figure 7

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審査請求 有 発明の数 1 (全5頁)

⑭ 発明の名称 往復、旋回切替型の振とう機

⑰ 特 願 昭62-131548

⑱ 出 願 昭62(1987)5月29日

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明 細 書

1. 発明の名称 往復、旋回切替型の振とう機

2. 特許請求の範囲

(1) 振とう機の機体上を直線往復運動する支持台車上に、支持台車の運動方向と直交する方向に往復運動可能な振とう台を載嵌し、該振とう台の中央部に直線往復作動と偏心旋回作動とに切替えることのできる動力受けの軸受部を設けたことを特徴とする往復、旋回切替型の振とう機。

3. 発明の詳細な説明

<産業上の利用分野>

この発明は直線往復作動と偏心旋回作動の両機能を備えた振とう機に関するものである。

<この発明が解消しようとする問題点>

従来振とう培養等に使用する振とう機は、直線往復作動して振とうする形式と、偏心旋回作動して振とうする形式の2形式が個別にあって、振とう方式の違いにより培養試料の経過及び結果のデ

ータに相違が生ずることがある。従って試料によっては両方式の振とうによるデータを要する場合も生ずるが、個別に2機種を設備することは費用と設備スペースの両面において実現が難しいという問題があった。

本発明は簡単な操作にて直線往復作動と偏心旋回作動とに切替え使用ができて、しかも構造が複雑とならず、従って比較的安価にて提供することのできる振とう機を提案してかゝる問題点を解消しようとするものである。

<発明の構成>

本発明は振とう機の機体上を直線往復運動する支持台車上に、支持台車の運動方向と直交する方向に往復運動可能な振とう台を載嵌し、該振とう台の中央部に直線往復作動と偏心旋回作動とに切替えることのできる動力受けの軸受部を設けたことを特徴とする往復、旋回切替型の振とう機にある。

<実施例>

以下図面に基づいて実施例を説明する。

箱形の機体1内の一隅に減速装置付きのモータ2を設置し、機体1の中心部にモータ2の動力をVベルト3受けするプーリ4を有して上下のベアリング入り軸受5, 6にて支承された回転軸7を設ける。回転軸7は上端を機体1の天板1a上に突出して水平な回転円盤8を支持している。回転円盤8の一半径上面に取り付けられた長孔9a付きの固定用部材9にベアリング軸受10を上部に備えた偏心軸11を挿し立てる。偏心軸11は長孔9a内を移動して偏心量を大小に調整可能にしてある。12は固定用のナットである。

機体1上に配置する平面視四角形の振とう台13は、その中心部に横長形の軸受孔14を設け、四方には垂壁15を折り下げ形成しており、振とう台13下に配置するひとまわり小さな支持台車16の向かい合う側壁16a, 16aの外側端部4ヶ所に上半を露

出するようにして取り付けられたガイドローラ17に嵌嵌する。なお、このときガイドローラ17の位置が前記の軸受孔14の長手側両側となるよう配置する。

支持台車16は中央に振とう台13の軸受孔14と同形状、同方向の軸受孔18を有し、前記ガイドローラ17の非取付側の側壁18b, 18b下の内側端部4ヶ所に走行用のホイール19を設けていて、偏心軸11の軸受10が軸受孔18及び軸受孔14と嵌合した状態で機体1の天板1a上に取り付けられたレール20, 20に嵌上するのである。

21は振とう台13の軸受孔14の長手側一方に進退自在に取り付けられた薄板状の切替板で、軸受孔14側に開口したすべり斜面22, 22とすべり斜面22, 22の交わる中央位置に軸受10とは異なる幅の軸受固定部23を有している。切替板21の両側はガイドレール24, 24に接し、後端に取り付けられた連結杆25は、支点26にて振とう台13に軸止された操作

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杆27の一方に連結していて、操作杆27の他方に接続する電磁シリンダ28のロッド28aの伸長により、切替板21は軸受孔14側に前進して軸受10を軸受孔14の中央部に固定し、また、逆の作動にて軸受10を解放するようになっている。

なお、振とう台13は支持台車16の側のガイドローラ17, 17下にそれぞれ一端を固定したスプリング部材29, 29の緊張にて通常は支持台車16の中央部に位置してローラ17上を揺動しないようになっている。30はプラスチック等の容器載上用に設ける取外し自在の架台である。

<発明の作用>

次に本発明の切替操作による直線往復作動と偏心旋回作動の作用例を説明する。

(1) 本発明振とう機を直線往復振とうに用いるときは、第4図に示すように切替スイッチ(図示していない)の操作により電磁シリンダ28のロッド28aを縮長し、切替板21を後退させて軸受10の

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固定を解く。モータ2を駆動して回転軸7を回転し、回転円盤8上に固定された偏心軸11をその偏心量を半径として旋回させるのである。すると軸受10は支持台車16及び振とう台13の両軸受孔14, 18内を自由に移動することができるので、第5図説明図に示すように偏心軸10の旋回軌道のうち軸受孔14, 18の長手方向へ働く力は支持台車16及び振とう台13のいずれにも作用せず、それ以外の方向へ働く力だけが作用することとなる。しかし乍ら、支持台車16の動きはレール20により規制されているために軸受孔14, 18の長手方向以外へ働く力は全て支持台車16を直線的に作動する力に変換され、以って振とう台13は支持台車16と共に偏心軸11の回転直径を振幅とする直線往復作動を繰り返すのである。なお、振とう台13はスプリング部材29, 29の緊張により揺動することなく支持台車16上の中央位置に一体的に支持されるのである。

(2) 本発明の振とう機を偏心旋回振とうに用い

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るときは、第6図に示すように切替スイッチ（図示していない）の操作により電磁シリンダー28のロッド28aを伸長し、切替板21を軸受孔14側に前進させて軸受10を軸受孔14の中心部に固定するのである。切替板21は前部に開口したすべり斜面22、22を設けてあるので、軸受10は中心位置より外れていても切替板21の前進に従ってスムーズに軸受固定部23まで案内される。

そこでモータ2を駆動すると、切替板21によって軸受10が中央部に固定された振とう台13は偏心軸11と同軌道の旋回振とうを行うこととなるが、この作動は第7図に示すように、前記したとおりの支持台車16の直線往復作動と、ガイドローラ17により支持台車16上に支えられた振とう台13が、支持台車16の運動方向と直交する方向に作動する縦横の直線往復運動の複合により実現されるのである。

直線往復振とうのときに振とう台13と支持台車

16を一体化するように作用したスプリング部材29、29は、その張力を偏心軸11の回転力よりも弱く設定することにより振とう台13の支持台車16上の作動を妨げないものとなる。

また、以上の直線往復振とう、偏心旋回振とうのいずれの場合も、振幅の大小調整は回転円盤8上の固定用部材9に挿し立てた偏心軸11を長孔9a内で移動するだけでよい。

なお、偏心軸を振とう台の中央に固定する手段は、実施例における切替板に限らず、2本のバーによる両側からの挟み止め方式等の他の構造に置き換えてもよい。

< 発明の効果 >

以上本発明の振とう機は偏心軸を横長形の軸受孔で軸受けする支持台車と振とう台のうち、振とう台の軸受部を切替えるという簡単な操作により、容易に直線往復振とうと偏心旋回振とうを使い分けすることができることになって、試料等の両振

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とう作動における各々の経過及び結果の精密なデータを得ることのできる効果を生ずる。また偏心旋回振とう時には別々の作動をする支持台車と振とう台とを単一の動力源である1本の偏心軸により作動する要領のため、切替型の振とう機でありながら、いずれの振とうの場合でも振幅の大小調整は1本の偏心軸を移動調整するだけでよく、構造簡単にして可及的に故障要因を少なくすることができると同時に製造コストも低くおさえることができるので比較的安価にて取扱い便利な振とう機を提供することができるという効果がある。

4. 図面の簡単な説明

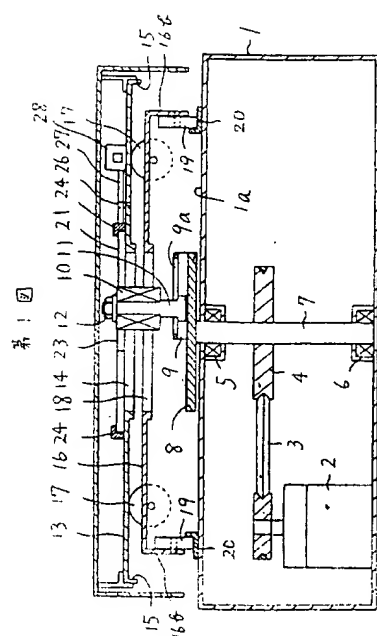
第1図は本発明実施例の縦断正面図、第2図は架台を取り外した状態にて示す正面図、第3図は同、平面図、第4図は直線往復振とう時の切替板の位置を示す部分平面図、第5図は同、偏心軸と軸受孔の作動関係を示す説明図、第6図は偏心旋回振とう時の切替板の位置を示す部分平面図、第

-8-

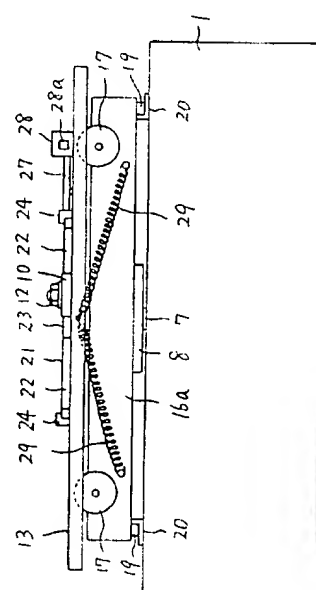
7図は同、支持台車の直線往復運動と直交する振とう台の直線往復運動の複合により振とう台が偏心旋回振とうする作動関係を示した説明図、1は機体、2はモータ、3はVベルト、4はプーリ、5、6は上下のベアリング軸受、7は回転軸、8は回転円盤、9は固定用部材、10軸受、11は偏心軸、12はナット、13は振とう台、14は軸受孔、15垂壁、16は支持台車、17はガイドローラ、18は軸受孔、19はホイール、20、20はレール、21は切替板、22、22はすべり斜面、23は軸受固定部、24、24はガイドレール、25は連結杆、26は支点、27は操作杆、28は電磁シリンダー、29、29はスプリング部材、30は架台である。

特許出願人 大洋科学工業株式会社
代理人 弁理士 永島郁二

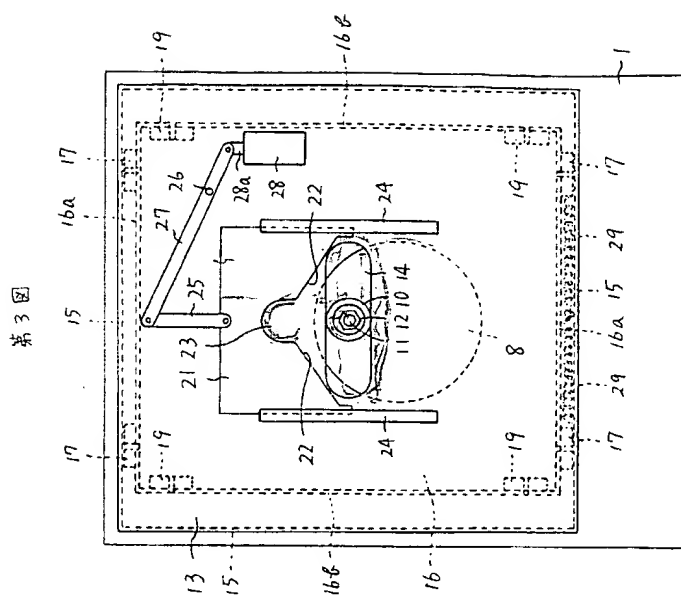




第 1

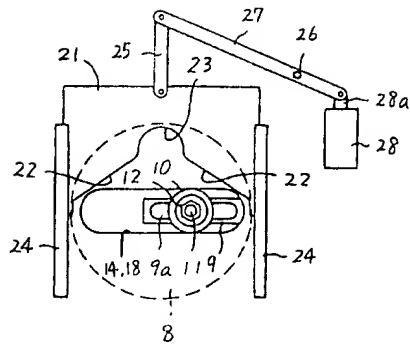


第 2 圖

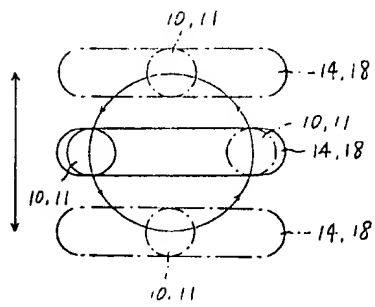


第 3 圖

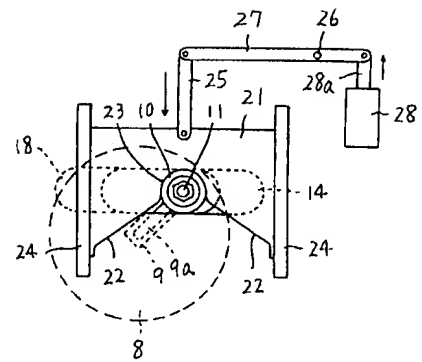
第4図



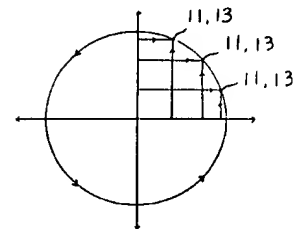
第5図



第6図



第7図



CLIPPEDIMAGE= JP363296831A

PAT-NO: JP363296831A

DOCUMENT-IDENTIFIER: JP 63296831 A

TITLE: RECIPROCATING-SWIVELING-SWITCHOVER TYPE SHAKING
MACHINE

PUBN-DATE: December 2, 1988

INVENTOR-INFORMATION:

NAME

NABEYA, YOSHIYUKI

ASSIGNEE-INFORMATION:

NAME

TAIYO KAGAKU KOGYO KK

COUNTRY

N/A

APPL-NO: JP62131548

APPL-DATE: May 29, 1987

INT-CL (IPC): B01F011/00;C12M001/00

US-CL-CURRENT: 435/303.3

ABSTRACT:

PURPOSE: To obtain the titled shaking machine capable of two different movements by simple mechanisms, at low cost and suitable for, e.g., culture of microorganisms, by making it possible to switch easily from a reciprocating straight-shaking to an eccentric swivel-shaking and vice versa by a simple operation to shift a bearing part of a shake table.

CONSTITUTION: A shake table 13 capable of reciprocating motion is mounted on a supporting truck 16 making a forward and backward movement on a machine frame 1 of a shake machine so that the direction of motion of the shake table 13

crosses the direction of movement of the truck 16 at right angles. A bearing part 10 for a driven shaft which makes possible switchover between a reciprocating straight-motion and an eccentric swivel-motion is provided at the center of the shake table. That is to say, by a simple operation, switchover between a reciprocating straight-motion and an eccentric swivel-motion is made possible and accurate data showing each developments and results produced in samples etc. in the both ways of shaking operations can be obtained. Although the machine is a switchover type, magnitude of amplitude can be adjusted by simply moving an eccentric spindle 11 in either ways of shaking operations, so that a machine of simple construction and comparatively low cost can be obtained.

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